SPEECH BY

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THE AMERICAN BUSINESSMAN HAS A LOT TO THINK ABOUT THESE DAYS: RISING LABOR COSTS, INFLATION, A PRICE FREEZE, AND A NUMBER OF OTHER PROBLEMS THAT BEAR DIRECTLY ON HIS ABILITY TO CONTINUE TO DO BUSINESS PROFITABLY. THUS, IN MANY INSTANCES, HE IS PREOCCUPIED WITH HIS OWN DAY-TO-DAY DIFFICULTIES. OFTEN, HE DOESN'T HAVE THE TIME, EVEN IF HE SHOULD HAVE THE INCLINATION, TO EXPLORE AREAS OUTSIDE HIS PARTICULAR FIELD. IT TAKES REAL EFFORT ON HIS PART, FOR EXAMPLE, TO EXAMINE A PROGRAM SUCH AS OUR EXPLORATION OF SPACE TO DETERMINE HOW IT RELATES TO HIM AND HIS PERSONAL INTERESTS.

Business problems

TO UNDERSTAND THE SPACE PROGRAM, AND PUT IT IN PROPER PERSPECTIVE, WE MUST FIRST RECOGNIZE THAT IT INVOLVES A GREAT DEAL MORE THAN LUNAR EXPLORATION. ALTHOUGH APOLLO CAPTURES THE HEADLINES, MANNED FLIGHTS TO THE MOON REPRESENT ONLY A FRACTION OF THE NATION'S OVERALL SPACE EFFORT. WE ALSO NEED TO GAIN A PERSPECTIVE AS TO WHAT THIS EFFORT COSTS. THE SPACE BUDGET FOR THIS FISCAL YEAR IS $3.2 BILLION. TO THE AVERAGE TAXPAYER THAT SEEMS LIKE A LOT OF MONEY. AND IT IS. BUT IT REPRESENTS ONLY 1.4 CENTS OF THE TAX DOLLAR. YOU MAY BE ABLE TO PUT OUR NATIONAL SPACE BUDGET IN BETTER PERSPECTIVE WHEN YOU REALIZE THAT $3.3 BILLION IS QUITE A BIT LESS THAN THE $4.6 BILLION DOLLARS SPENT LAST YEAR BY THE TEN LEADING U. S. ADVERTISERS.

Space — More than Lunar progs

IF THE APOLLO PROGRAM IS ONLY A SEGMENT OF OUR SPACE EXPLORATION, WHAT DO WE DO WITH THIS MONEY? LIKE THE MODERN BUSINESSMAN, WE IN THE SPACE BUSINESS MUST WEAR MANY HATS. A SUCCESSFUL BUSINESSMAN IS A MERCHANDISER, A MARKET ANALYST, A PRODUCTION MAN, A SALESMAN, A PERSONNEL ADMINISTRATOR, A SPECIALIST IN DISTRIBUTION, AND MANY OTHER THINGS. IF HE ISN'T, HE PROBABLY WON'T BE ABLE TO COMPETE IN THE MARKET PLACE.

SIMILARLY, AN EFFECTIVE AND SUCCESSFUL SPACE PROGRAM DEALS IN JUST AS WIDE A GAMUT OF SPECIALTIES. OUR SPACE EFFORT TODAY IS A CAREFULLY BLENDED MIX OF MANNED AND UNMANNED FLIGHTS. WE FLY IN A VARIETY OF ORBITS, TRAVEL TO THE MOON, AND GO OUT INTO THE SOLAR SYSTEM. WE EXPLORE THE PLANETS, THE SUN, AND THE INTERPLANETARY MEDIUM WITH INSTRUMENTED PAYLOADS. WE LOOK OUTWARD AT THE GALAXY THROUGH SPACE-BORNE TELESCOPES. WE LOOK INWARD AT OUR OWN EARTH AND ITS ENVIRONMENT, USING DELICATE AND VERSATILE SENSORS THAT REPORT ON EARTH'S RESOURCES, ITS CROPS, ITS OCEANS AND RIVERS, ITS GEOLOGY, AND OUR USE OF ITS LAND AREAS. WE EMPLOY A VARIETY OF APPLICATIONS SATELLITES. ONE TYPE HELPS THE WEATHERMEN MAKE PREDICTIONS BY FURNISHING PICTURES OF CLOUD COVER ALONG WITH DATA ON THE DYNAMICS OF OUR ATMOSPHERE WHICH

MAKE THE WEATHER. OTHER TYPES PROVIDE FAST, RELIABLE LONG-RANGE COMMUNICATIONS, AND INTERNATIONAL TELEVISION BROADCASTS, AT DRAMATIC SAVINGS IN COST. NAVIGATION SATELLITES WILL SOON BE A FACT. THEY WILL HELP EASE THE TRAFFIC JAM IN OUR AIR CORRIDORS, AND AROUND OUR AIRPORTS. THEY WILL ALSO MAKE A SIGNIFICANT CONTRIBUTION TO OUR NOW-MARGINAL AIR TRANSPORT SAFETY.

THE FIRST "A" IN NASA STANDS FOR AERONAUTICS, AND WE CONDUCT A VIGOROUS PROGRAM IN AERONAUTICAL RESEARCH. FOR EXAMPLE, WE WORK AT BOTH ENDS OF THE SPEED SPECTRUM: WITH VERTICAL AND SHORT-TAKE-OFF-AND-LANDING PROTOTYPES, AS WELL AS WITH DESIGNS INTENDED TO FLY AT SIX TIMES THE SPEED OF SOUND. THE NEXT GENERATION OF SUBSONIC PLANES WILL FLY ON A LOW-DRAG WING CONFIGURATION, ORIGINATED BY NASA, THAT WILL PERMIT AN INCREASE IN EITHER SPEED OR RANGE WITHOUT ADDING TO FUEL CONSUMPTION. IT WILL BE POWERED WITH A QUIET ENGINE ALSO OF NASA DESIGN. RESEARCH IS NOW IN PROGRESS THAT WILL REDUCE NOISE AROUND AIRPORTS.

Aeronautics

UNDERPINNING OUR WHOLE ACTIVITY IS A PROGRAM OF ADVANCED RESEARCH -- BOTH BASIC RESEARCH AND RESEARCH IN SUPPORT OF DEVELOPMENT -- WHICH DEALS IN MATERIALS THAT ARE VERY STRONG AND VERY LIGHT, IN MICROSCOPICALLY SMALL ELECTRONIC COMPONENTS, IN MORE EFFICIENT PROPULSION, UNCONVENTIONAL ENERGY SOURCES AND A NUMBER OF OTHER AREAS. THE FINDINGS OF THIS KIND OF INVESTIGATION HAVE HAD, AND WILL CONTINUE TO HAVE, A PROFOUND INFLUENCE ON THE MAINTENANCE OF OUR TECHNOLOGICAL PROFICIENCY AS A NATION.

Advanced Research

CONSEQUENTLY, THE MISSIONARY SPIRIT IN ME COMES TO THE FORE WHEN I HEAR THE SPACE PROGRAM SIMPLISTICALLY DESCRIBED AS THE MOON LANDING -- PARTICULARLY WHEN THIS IS FOLLOWED, AS IT OFTEN IS, WITH THE COMMENT THAT WE'VE DONE IT SEVERAL TIMES, AND NOW WE SHOULD BE GETTING BACK TO EARTH.

I REACT IN THIS WAY, NOT ALONE TO A FATALLY OVERSIMPLIFIED APPROACH, BUT BECAUSE OUR SPACE PROGRAM IS NOW AT A CROSSROADS. LIKE THE PATRONYMIC OF YOUR CLUB, THE WORLD'S LEADING SPACE PROGRAM CAME OUT OF THE WEST; AND THE QUESTION IS NOW SHARPLY AT ISSUE AS TO WHETHER THE GREAT TECHNOLOGICAL ADVANCES AND LEADERSHIP WILL CONTINUE TO COME OUT OF THE WEST, OR WHETHER SPACE LEADERSHIP WILL SLIP AWAY TO THE EAST -- TO THE LABORATORIES AND LAUNCHING PADS OF THE SOVIET UNION.

X roads - will leadership pass to the East?

IN SO SAYING, I AM NOT RAISING THE SPECTRE OF A SPACE RACE WITH RUSSIA. THERE IS NO NEED FOR THE UNITED STATES TO ATTEMPT A POINT-TO-POINT RESPONSE TO THE SOVIET PROGRAM. BUT I INVITE YOUR ATTENTION TO THE FOLLOWING FACTS. LAST YEAR, AND SO FAR THIS YEAR, THE SOVIETS HAVE LAUNCHED THREE SPACECRAFT TO OUR ONE. FURTHER, THEY ARE SPENDING AT LEAST AS MUCH ON SPACE AS WE ARE, DRAWING ON A GROSS NATIONAL PRODUCT THAT IS ONE-HALF AS LARGE AS OURS. IN RELATIVE TERMS, THEIR SPACE EFFORT IS ROUGHLY TWICE OURS.

BECAUSE OF THE SPECTACULAR SUCCESS OF OUR APOLLO PROGRAM, MANY AMERICANS THINK WE ARE FAR AHEAD IN SPACE. THE FACTS MAY BE DISTRESSINGLY THE OPPOSITE. IT IS AXIOMATIC THAT THE RESULTS PRODUCED BY A RESEARCH AND DEVELOPMENT ACTIVITY ARE IN NEARLY DIRECT RATIO TO THE VOLUME OF RESOURCES AND EFFORT INVESTED IN IT. THE EFFECTS OF THE SOVIET INVESTMENT ARE ALREADY BECOMING VISIBLE. WHERE, IN JULY 1969, WE COULD ASSERT A U. S. PRE-EMINENCE IN SPACE, WE CAN NOT NOW MAKE THAT CLAIM WITH SOLID ASSURANCE THAT IT IS VALID. SOME OBSERVERS BELIEVE THAT RUSSIA HAS BUILT A SUBSTANTIAL LEAD IN IMPORTANT AREAS.

CONSIDER OUR PRESENT POSITION. AFTER THE LAST APOLLO MISSIONS AND SKYLAB, WHICH WILL FLY IN THE SPRING OF 1973, THERE WILL BE A GAP OF PERHAPS FIVE YEARS WITHOUT A MANNED FLIGHT. AS YOU MAY RECALL, WORK ON APOLLO STARTED IN 1961, AND DEVELOPMENT OF SKYLAB BEGAN IN 1965. WE HAVE NO OTHER DEVELOPMENTAL PROGRAMS ON THIS ORDER CURRENTLY IN PROGRESS.

THE FINAL WEATHER SATELLITE DEFINITELY IN THE PROGRAM WILL FLY IN 1974. THE ONLY MAJOR INTERPLANETARY EFFORT SCHEDULED AFTER 1974 ARE TWO VIKING MISSIONS TO PLACE INSTRUMENTED PACKAGES ON THE MARTIAN SURFACE IN THE 1975-76 TIME PERIOD.

TOMORROW, IF ALL GOES WELL, A U. S. MARINER SPACECRAFT WILL ENTER MARTIAN ORBIT. ITS INSTRUMENTS WILL STUDY THE MARTIAN ENVIRONMENT. AS IT CIRCLES THE PLANET, THE SPACECRAFT WILL MAP 70 PER CENT OF MARS' SURFACE, AND TELEVISE BACK TO EARTH A RECORD OF THE PLANET'S TOPOGRAPHY. MARINER 9 IS A TECHNOLOGICALLY COMPLEX AND DIFFICULT MISSION. AS IT WILL PROVIDE 12 TIMES MORE PLANETARY DATA THAN ALL PREVIOUS MISSIONS COMBINED, ITS SUCCESSFUL EXECUTION WILL MAKE A MAJOR SCIENTIFIC CONTRIBUTION TO PLANETOLOGY. HOWEVER, PERTINENT TO

MY EARLIER POINT ON THE SCALE OF THE SOVIET EFFORT, TWO VERY LARGE RUSSIAN SPACECRAFT ARE FOLLOWING HARD ON MARINER'S HEELS. THEY ARE NEARLY FIVE TIMES HEAVIER THAN OUR SPACECRAFT WHICH SUGGESTS THAT THEY MAY SOFT-LAND INSTRUMENTS ON THE SURFACE. IF THEY DO SO, THEY WILL BE MORE THAN THREE YEARS AHEAD OF THE UNITED STATES.

FROM THE FOREGOING YOU MAY THINK ME PESSIMISTIC. IF SO, THE IMPRESSION IS ERRONEOUS. I AM AN OPTIMIST ABOUT OUR SPACE FUTURE. I AM CONVINCED THAT OUR PLANS FOR THE SEVENTIES WILL GIVE US THE SOUND PROGRESSIVE PROGRAM THAT WE, AS A NATION, REQUIRE. HOWEVER, PLANS MUST BE IMPLEMENTED. I AM EMPHASIZING OUR PRESENT SITUATION BECAUSE I THINK WE SHOULD NOT WAIT UNTIL WE ARE NUMBER TWO TO TRY HARDER.

FOR EXAMPLE, WE KNOW, NOW, THAT IN THE LATE SEVENTIES WE WILL NEED AN ADVANCED DELIVERY SYSTEM -- THE SPACE SHUTTLE. IN ITS MOST DESIRABLE DESIGN, THE BOOSTER WILL CARRY THE ORBITER, PIGGY BACK, TO ABOUT 40 MILES ALTITUDE WHERE THE LATTER WILL SEPARATE AND PROCEED, UNDER ITS OWN POWER, INTO ORBIT. THE BOOSTER WILL THEN FLY BACK AND LAND ON AN AIRSTRIP. WHEN IT HAS COMPLETED ITS MISSION THE ORBITER WILL DO LIKEWISE. WE WILL BE ABLE TO RE-USE THEM 100 TIMES WHICH

WILL GREATLY INCREASE OUR VERSATILITY, AND ENABLE US TO PUT LARGE PAYLOADS IN LOW-EARTH ORBIT FOR ROUGHLY $5 MILLION A FLIGHT. THIS IS IN CONTRAST TO THE COST OF A SATURN V -- ABOUT $180 MILLION -- WHICH WE USE ONCE AND DISCARD.

WITH THE SHUTTLE, WE CAN REPAIR SPACECRAFT IN ORBIT, OR RETRIEVE THEM FOR REFURBISHING ON EARTH. IT WILL GIVE US A RESCUE CAPABILITY, AND CAN, ITSELF, SERVE AS A MANNED FLYING LABORATORY FOR FLIGHTS OF AS MUCH AS A WEEK'S DURATION. THE ECONOMIES REPRESENTED HERE ARE SUBSTANTIAL. IN THE LONG TERM, THE SHUTTLE MEANS A GREAT DEAL MORE SPACE FOR A GREAT DEAL LESS MONEY.

WHEN WE SPEAK OF THE SHUTTLE, WE ARE SPEAKING OF A MAJOR DEVELOPMENT EFFORT WHICH WILL SPAN ROUGHLY EIGHT YEARS. ~~OVER THAT PERIOD, TOTAL COSTS MAY BE AS MUCH AS $12 BILLION.~~ WE COME HERE TO THE STICKING POINT. OBVIOUSLY, IF WE ARE TO HAVE THE SHUTTLE IN THE LATE '70'S, WE MUST COMMIT NOW. WE MUST RESIST THE TEMPTATION TO TEMPORIZE; TO POSTPONE THE DECISION BECAUSE OF SHORT-TERM CONSIDERATIONS. EVEN THOUGH THE SHUTTLE IS AN INVESTMENT IN THE FUTURE WHICH WILL NOT PAY MAJOR DIVIDENDS UNTIL THE '80S, THE TIME TO ACT IS NOW.

IF WE ARE NOT PREPARED TO MAKE THIS KIND OF COMMITMENT -- AND THERE ARE OTHERS THAT HAVE TO BE MADE, SUCH AS DECISION TO GO AHEAD WITH THE GRAND TOUR SPACECRAFT -- WE WILL BE GUILTY OF A SHORTSIGHTEDNESS THAT WILL COST US DEARLY IN THE LONG RUN.

AS ~~BUSINESSMEN,~~ I AM SURE YOU CAN APPRECIATE THE ECONOMICS OF A PROGRAM THAT PROVIDES CONTINUITY OF EFFORT; AND SMOOTH, EFFICIENT PROGRESS TOWARD WISELY-SELECTED GOALS. YOU ACCEPT, IN PRINCIPLE, THE NEED TO INVEST NOW FOR THE FUTURE. BUT SOME IN THE BUSINESS COMMUNITY -- PERHAPS MEN WITHIN THE SOUND OF MY VOICE -- ARE CONCERNED WITH A MORE BASIC QUESTION. THEY ARE NOT PERSUADED THAT WE NEED A SPACE PROGRAM. THEY CANNOT RELATE THE USES OF A SPACE PROGRAM TO THEIR OWN WELL-BEING, OR THAT OF THEIR FELLOW MEN.

Continuity important.

WHEN WE CONSIDER THE TALENT AND THE RESOURCES THAT HAVE BEEN THUS FAR INVESTED IN SPACE EXPLORATION, AND THE COMMITMENTS TO THE FUTURE THAT I AM ADVOCATING, THIS IS INDEED A VALID QUESTION. IT DESERVES A DEFINITIVE AND SPECIFIC RESPONSE. I WILL ATTEMPT TO PROVIDE ONE.

Why Space

THE REASONS FOR A VIGOROUS SPACE PROGRAM ARE MULTIPLE AND, COLLECTIVELY, COMPELLING. THUS FAR, I HAVE NOT DISCUSSED THE IMPLICATIONS OF OUR SPACE CAPABILITY FOR NATIONAL SECURITY. THE MILITARY APPLICATIONS OF SPACE ARE NOT IN NASA'S NOR MY PROVINCE. I WILL SIMPLY ASK OF YOU A SIMPLE QUESTION. WHAT CAN BE SAID ABOUT THE SAFETY OF THE NATION, IF BY DEFAULT WE GIVE THE SOVIET UNION FREE REIN IN ALL REGIONS ABOVE 60,000 FEET?

TO FOCUS ON THE PEACEFUL USES OF SPACE, LET US FIRST CONSIDER WHAT MIGHT BE CALLED THE "REMOTE" BENEFITS OF SPACE: THE PRODUCT OF SPACE SCIENCE. WHAT IS INVOLVED HERE IS NEW KNOWLEDGE OF A MOST FUNDAMENTAL KIND. WE ARE MAKING NEW DISCOVERIES PERTAINING TO THE ORIGINS OF THE SOLAR SYSTEM AND THE UNIVERSE. WE ARE GAINING NEW INFORMATION ON THE COMPOSITION AND BEHAVIOR OF THE SUN; AND THE INTERACTION OF SOLAR FORCES WITH THE ENVELOPE OF ENERGY WHICH ENCASES OUR ATMOSPHERE. WE ARE ALSO COLLECTING A FLOOD OF ESSENTIAL DATA ON OUR OWN ENVIRONMENT. THIS DATA WILL LEAD TO A BASIC UNDERSTANDING OF ITS DYNAMICS, AND THEIR RELATIONSHIP TO THE ECOLOGY UPON WHICH OUR EXISTENCE DEPENDS.

I DESCRIBE THIS AND SIMILAR SPACE-PRODUCED KNOWLEDGE AS "REMOTE" SIMPLY BECAUSE IT IS OFTEN NOT POSSIBLE TO DETERMINE, IMMEDIATELY, HOW OR WHERE IT FITS IN TO THE SCHEME OF THINGS. WE KNOW FROM EXPERIENCE THAT IT DOES FIT IN. WE KNOW THAT IT CAN HAVE A PERVASIVE INFLUENCE ON OUR LIVES. IN THE PAST, THE DEVELOPMENT OF THE THEORY OF OPTICS EVENTUALLY LED TO THE MANUFACTURE OF LENSES FOR HIGH-POWERED MICROSCOPES WITHOUT WHICH THERE WOULD BE NO SCIENCE OF BIOLOGY AS WE KNOW IT.

SIMILARLY, TODAY, OUR ORBITING ASTRONOMICAL OBSERVATORIES ARE PROVIDING INFORMATION ON OBJECTS IN OUR GALAXY THAT RADIATE AS MUCH ENERGY IN ONE DAY AS OUR SUN HAS GENERATED IN ITS ENTIRE LIFETIME. THERE IS NOTHING IN OUR PHYSICS THAT CAN EXPLAIN THIS. SPACECRAFT STUDIES OF THIS PHENOMENON WILL ALLOW DEVELOPMENT OF A THEORY ON HOW THIS COMES ABOUT. THE THEORY COULD LEAD TO AN ENTIRELY NEW METHOD OF ENERGY GENERATION ON EARTH THAT MIGHT HELP RESOLVE THE "ENERGY CRISIS" THAT IS SURELY APPROACHING.

Deep-space

THIS PHASE OF OUR VENTURE INTO SPACE SATISFIES A BASIC HUMAN REQUIREMENT WHICH HAS BEEN ELOQUENTLY DESCRIBED BY THE EXPLORER FIRDTJOF NANSEN: "THE HISTORY OF THE HUMAN RACE IS A CONTINUOUS STRUGGLE FROM DARKNESS TOWARD LIGHT. IT IS THEREFORE OF NO PURPOSE TO DISCUSS THE USE OF KNOWLEDGE -- MAN WANTS TO KNOW, AND WHEN HE CEASES TO DO SO, HE IS NO LONGER MAN."

Darkness to light

TO MOVE FROM THE REMOTE TO THE IMMEDIATE AND THE PRACTICAL, WE HAVE AN OPERATIONAL SYSTEM OF WEATHER SATELLITES WHICH PROVIDES PICTURES OF THE WORLD'S CLOUD COVER DAILY, AS WELL AS TEMPERATURE PROFILES OF THE ATMOSPHERE. WE ARE EXPERIMENTING WITH A MORE ADVANCED METEOROLOGICAL SPACECRAFT WHICH WILL GATHER OTHER WEATHER DATA, AS WELL. THE TIME IS NOT FAR DISTANT WHEN ACCURATE 14-DAY FORECASTS WILL BE PART OF OUR DAILY ROUTINE. THE NEXT STEP WILL BE THE CONSTRUCTION OF DETAILED MODELS OF GLOBAL WEATHER SYSTEMS, AND THE BEGINNINGS OF WEATHER MODIFICATION. THE ECONOMIC VALUE OF LONG-RANGE FORECASTS HAS BEEN ESTIMATED AT $2.5 BILLION FOR THIS COUNTRY ALONE. THE WORTH OF WEATHER MODIFICATION WOULD PROBABLY BE AN ORDER OF MAGNITUDE GREATER. THINK WHAT IT WOULD MEAN TO US ECONOMICALLY -- TO THE FARMERS AND THE RESORT OWNERS, TO CITE TWO GROUPS -- IF, AS RECENTLY SUGGESTED BY UNDERSEA EXPLORER JACQUES COSTEAU, WE GAINED THE ABILITY TO INFLUENCE THE WEATHER SO THAT IT RAINED ONLY AT NIGHT.

Applications weather prediction

ALTHOUGH THEY ARE SO MUCH A PART OF OUR DAILY LIVES THAT THEY ARE OFTEN TAKEN FOR GRANTED, COMMUNICATIONS SATELLITES NOW GIVE US, FOR THE FIRST TIME, A SYSTEM OF RELIABLE, FAST, LONG RANGE COMMUNICATIONS. ~~THE COST IS ROUGHLY ONE-TENTH THAT OF LAND LINES~~. THEY MAKE POSSIBLE INTERNATIONAL TELECASTS.

IN THE FUTURE ARE DIRECT BROADCAST SATELLITES CAPABLE OF TELECASTS TO HOME RECEIVERS. THESE HAVE AN IMMENSE AND VARIED POTENTIAL. AS AN EDUCATIONAL TOOL, FOR EXAMPLE, THEY COULD WIPE ILLITERACY FROM THE FACE OF THE EARTH.

I HAVE MENTIONED NAVIGATION SATELLITES THAT WILL GIVE PILOT, AIR CONTROLLER, OR SHIP CAPTAIN A QUICK AND PRECISE POSITION FIX. THEY WILL PERMIT SPACING IN AIR CORRIDORS TO BE REDUCED WITH SAFETY. THEY WILL SUBSTANTIALLY LESSEN THE HAZARD OF COLLISIONS AT SEA, AND END THE NEED FOR ELABORATE SEARCHES FOR AIR- OR SEA CRAFT IN TROUBLE.

PHOTOGRAPHY FROM SEVERAL OF THE LATER GEMINI FLIGHTS AND EXPERIMENTS WITH MULTI-SPECTRAL SENSING ON APOLLO 9 HAVE OPENED UP AN EXCITING AND UNFORESEEN PROSPECT FOR SPACE WORK. ADVANCES IN SENSING TECHNOLOGY AND THE MATCHLESS OVERVIEW OF EARTH FROM SPACE, IN COMBINATION, ALLOW A SURVEY OF EARTH RESOURCES THAT WILL BE A POWERFUL TOOL IN THEIR BETTER MANAGEMENT. SPACE PHOTOGRAPHY HAS SHOWN GEOLOGISTS SURFACE FEATURES THAT INDICATE PREVIOUSLY UNDISCOVERED STORES OF OIL AND MINERALS. THE SENSORS CAN IDENTIFY DISEASES IN CROPS AND TIMBER, TELL OUR FARMERS WHEN THEY SHOULD HARVEST THEIR CROPS, AND GUIDE FISHERMEN TO PROMISING FISHING GROUNDS.

THESE ARE ONLY A FEW OF THE MANY POSSIBLE USES OF REMOTE SENSING. IN ITS TOTALITY, IT GIVES US THE CAPABILITY FOR A COMPREHENSIVE AND CONTINUOUS SYSTEM OF MONITORING THE WHOLE ENVIRONMENT. OF MORE CONSEQUENCE, IT CAN REPORT WHAT MAN IS DOING TO IT -- FOR THE FIRST TIME SINCE THE CREATION.

I WOULD LIKE BRIEFLY TO MENTION SPIN-OFF -- THE APPLICATION OF INNOVATIONS AND INVENTIONS, DEVELOPED IN OUR SPACE WORK, TO NON-SPACE INDUSTRY. THESE RUN THE GAMUT FROM GROOVED RUNWAYS TO PREVENT SKIDDING, TO MINUSCULE TRANSCEIVERS SO SMALL THAT THEY CAN BE INSERTED INTO THE AORTA OF THE HUMAN HEART. THEY INVOLVE IMPROVED FUEL CELLS, AND FIBER COMPOSITES STRONGER THAN STEEL AND HALF ITS WEIGHT. THE SPACE PROGRAM HAS ALSO MADE A CONTRIBUTION TO AMERICAN INDUSTRY, INTANGIBLE BUT PERHAPS MORE IMPORTANT THAT MATERIAL SPIN-OFFS. THIS IS THE DEVELOPMENT OF NEW MANAGEMENT TECHNIQUES FOR DEALING WITH BIG SYSTEMS.

IN CLOSING, I WOULD LIKE TO COMMENT ON THE RELATIONSHIP OF THE SPACE PROGRAM TO THE NATION'S ECONOMY. WE HAVE SEEN THAT SPACE EXPLORATION -- AND THE ACCOMPANYING WORK THAT GOES WITH IT -- IS A PRIME GENERATOR OF NEW TECHNOLOGY. INCREASINGLY, THIS NATION WILL BECOME A HIGH TECHNOLOGY ECONOMY.

ITS INDUSTRY WILL, MORE AND MORE, BE RELIANT ON A STEADY FLOW OF NEW PROCESSES AND PRODUCTS. WE HAVE WITNESSED THE IMPACT OF ADVANCED COMPUTER TECHNOLOGY -- IN WHICH NASA WAS A FORCING FACTOR -- TO A POINT WHERE IT IS A MAJOR ITEM IN U. S. PRODUCTION, AND ONE OF THE NATION'S LEADING EXPORTS.

WHILE IT WOULD BE RASH TO ATTEMPT TO SELECT THE NEW TECHNOLOGY THAT WILL PLAY THE ECONOMIC ROLE OF THE COMPUTER IN THE DECADE TO COME, THERE WILL BE ONE -- PERHAPS MORE THAN ONE. THE CHANCES ARE THAT THE SPACE EFFORT WILL BE INSTRUMENTAL IN ITS DEVELOPMENT TO A POINT WHERE IT BECOMES A PACING ELEMENT IN THE NATIONAL ECONOMY. HOWEVER, I CAN ONLY MAKE THIS FORECAST ON ONE ASSUMPTION. THAT IS -- THAT WE WILL BE ABLE TO OBTAIN COMMITMENTS, THIS YEAR AND NEXT, WHICH WILL ENSURE THAT THE SPACE PROGRAM CAN MOVE AHEAD EVENLY AND EFFICIENTLY TOWARD ITS GOALS FOR THE '70S. DURING THE DECADE TO COME, I CAN ASSURE YOU THAT AN ADVANCING SPACE PROGRAM WILL NOT ONLY HELP THIS COUNTRY MAINTAIN ITS TECHNOLOGICAL LEADERSHIP, BUT WILL RETURN TO YOU -- BOTH AS INDIVIDUALS AND BUSINESSMEN -- A RICH PAYOUT OF BENEFITS.

SOME YEARS AGO, THE LATE DR. HUGH DRYDEN -- NOT ONLY A SCIENTIST OF WORLD RENOWN BUT A WISE OBSERVER OF NATIONAL AFFAIRS -- WAS TESTIFYING TO THE HOUSE COMMITTEE ON SCIENCE AND ASTRONAUTICS. HE WAS DISCUSSING THE CONSEQUENCES OF THE POSTPONEMENT OF A DECISION TO PROCEED BEYOND PROJECT MERCURY. HE TOLD THE COMMITTEE:

> "HAVE WE LEARNED ENOUGH FROM THE OFTEN BITTER AND ALWAYS COSTLY EXPERIENCE OF THE LAST HALF CENTURY NOT ONLY TO CARRY OUT WITH DETERMINATION THIS EFFORT TO MEET THE REQUIREMENTS OF THE PRESENT IN SPACE RESEARCH AND EXPLORATION, BUT TO EXERCISE THE VISION WHICH IS DEMANDED IF WE ARE NOT, ONCE AGAIN, TO FIND OURSELVES LAGGING IN THE NEXT PHASE OF THIS MOST CHALLENGING EFFORT....
>
> THE DECISIONS WHICH CONFRONT US TODAY ARE THOSE WHICH DETERMINE WHETHER THIS KIND OF HISTORY WILL REPEAT ITSELF A FEW YEARS HENCE, AND WHETHER WE WILL ONCE AGAIN EXPERIENCE A BITTER AWAKENING TO THE FACT THAT OTHERS HAVE SEIZED THE INIATIVE IN THE MORE ADVANCED SPACE MISSIONS OF THE FUTURE...."

IF WE ALLOW HISTORY TO REPEAT ITSELF, OUR AWAKENING SOME YEARS FROM NOW WILL BE BITTER INDEED.